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A synonymic list of names associated with western Palaearctic *Melitaea phoebe* (Denis & Schiffermüller, 1775) species group taxa (*M. phoebe*; *M. punica* Oberthür, 1876; *M. ornata* Christoph, 1893) (Lepidoptera, Nymphalidae)

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Abstract. Following indecision and confusion in the literature regarding nomenclature and distribution of *Melitaea phoebe* (Denis & Schiffermüller, 1775) and its closely associated congeners *M. punica* Oberthür, 1876, and *M. ornata* Christoph, 1893, a synonymic list of *phoebe* names, and of names both correctly and mistakenly associated with *phoebe* species-group taxa, is presented. Explanatory footnotes provide the basis of a stable source for future discussion of *M. phoebe* species-group populations throughout the species' ranges.

Introduction

According to a recent revision (van Oorschot and Coutsis 2014), the genus *Melitaea* Fabricius, 1807, comprises some 98 species of phenotypically similar, medium sized nymphaline butterflies that occur throughout most of the Palaearctic Region and beyond. Adults are invariably orange-brown on the upper surface, with a series of black lines and other markings; several *Melitaea* species are notoriously difficult to separate using wing morphology due to their similarity in appearance (Jugovic and Koren 2014).

In this paper, we consider the common and widespread butterflies *Melitaea phoebe* (Denis & Schiffermüller, 1775) and *M. ornata* Christoph, 1893; the latter was not fully recognised as a species distinct from *M. phoebe* until 2005 (see below). We also confirm, not for the first time, that *M. punica* Oberthür, 1876, historically considered a subspecies of *M. phoebe*, is restricted in distribution to Africa north of the Sahara; the specificity of *M. punica* was confirmed by Tóth and Varga (2011). Some fundamental confusion has encompassed the use of names relating to these three phenotypically similar *Melitaea* species in the western Palaearctic. We believe that confusion, for which the present authors must take some responsibility (with others!), arose as a direct result of the realisation that a second *phoebe*-like taxon occurred in Europe, before the extent of the range of *M. ornata* was fully understood. Before that was established, some other names were briefly used in the literature (e.g. *emipunica* [by Russell et al. 2005] and *ogygia* [by Varga et al. 2005]).

As recognised here, the western Palaearctic Region extends from the Iberian Peninsula and Africa north of the Sahara in the west to the Ural Mountains and Kazakhstan in the east (approxi-

mately 60° East), and from the North Cape of Norway in the north to the Middle East, including Iran and Iraq, in the south (approximately 30° North). We recognise that a number of names relate to *Melitaea* taxa east of the Urals, and where these apply or may apply to the taxa considered in this paper, they are also included.

Background

A detailed analysis of the Palaearctic forms and varieties associated with *Melitaea* Fabricius, 1807, was made by Higgins (1941, 1944 [errata], 1955 [additions]). He recognised *M. phoebe* as a distinct species (Higgins 1941: 325–343, plate 14, figs 1–12; plate 15, fig. 8) with three subspecies: nominotypical *phoebe* (throughout the region except the Iberian Peninsula and North Africa), *occitanica* Staudinger, 1871 (Iberian Peninsula) and *punica* (North Africa). Considering what was available to Higgins at that time, he provided what remains a generally accurate assessment of the division of *M. phoebe sensu lato*. Higgins provided (1941: 325–343) an annotated list of 74 named forms, mostly originating from the western Palaearctic, and many described individual variations, seasonal forms and aberrations. He later added (Higgins 1955: 118) five additional synonyms for *M. phoebe*.

So where did it all go so wrong? Modern confusion seems to stem from Hesselbarth et al. (1995: 1030), who mistakenly (see Appendix: Note 3), used the complex name: '*M.* (*phoebe*) *punica telona*' for those *phoebe*-like butterflies from Turkey which were not, in their opinion – and undoubtedly correctly – *M. phoebe sensu stricto*. Understandably, their work was used as an anchor for subsequent papers on the region; for example, Çalişkan and Bozaci (2015) described a male aberration of what they considered to be *M. phoebe* from the province of Adana, Turkey, placing the name *ornata* as a synonym of "*M. punica telona*". They referenced Hesselbarth et al. (1995), from where their use of the combination '*punica telona*' presumably originated. With several researchers working in different parts of Western Europe and the Russian Federation, it is perhaps understandable that this spurious use of the name *punica* became so widely used (see Appendix: Note 3).

M. ornata was first recognised as a species separate from *M. phoebe* simultaneously by Varga et al. (2005), from Hungarian specimens, under the specific name *M. ogygia* Fruhstorfer, 1908 [TL: Island of Poros, Peleponnese, Greece] and by Russell et al. (2005), from specimens reared from a female from Montagna Longa, Palermo district, Sicily, under the name *M. emipunica* Verity, 1919 [TL: Palermo district, Sicily, Italy]. The presently known eastern limit of the distribution of the invariably univoltine species *M. ornata* may coincide with the eastern limit of our interpretation of the western Palaearctic (see above), although a recent publication by Korb et al. (2015) recorded *M. ornata* from Middle Asia (Kyrghyz Mts., Transili Alatau Mts. and Kungey Ala-Too Mts.). Previously, Korb (2011: 178) reported this same material as *M. phoebe saturata* but following molecular analysis of the preserved specimens by Korb et al. (2015) their identity was reassessed as *M. ornata*. We note that larvae from this area are yet to be observed and believe further research is required to confirm their identity.

Placement of *M. ornata* and some associated Russian taxa as synonyms of *M. phoebe* by van Oorschot and Coutsis (2014: 60) compounded the confusion referred to above. In the expectation of resolving some long-standing matters of nomenclature and distribution, we present an alphabetical list of names associated with *Melitaea phoebe* species-group taxa and place each

as a synonym of *M. phoebe* [Notes 1 & 6], *M. ornata* [Notes 2 & 6], or *M. punica* [Notes 3 & 6]. These actions are explained and supported by detailed notes (see the Appendix). The present authors do not recognise any subspecific divisions of *M. ornata* or *M. punica*; however, *M. phoebe s.s.* occurs in two distinct subspecies based on larval colour and distribution: *M. phoebe phoebe* [Note 4] and *M. phoebe occitanica* [Note 5], with which some names will be synonymised.

Distribution of *Melitaea phoebe*, *M. punica*, and *M. ornata* within the western Palaearctic, as currently known and understood

Distribution of *M. phoebe phoebe* and *M. phoebe occitanica* in the western Palaearctic is presented in Note 1. However, it is considered important to clarify some details as to where, so far as is currently known, *M. phoebe* has been recorded as being present in the literature but is not in fact present:

(1) *M. phoebe* has been recorded from Lésvos and Chíos (Gaskin and Littler 1986) but it is *M. ornata* which is present there (Russell and Pateman 2013c); in fact it is almost certain that all reports of *M. phoebe* from the Aegean Islands should be regarded as *M. ornata* (Russell and Pamperis 2011, 2012).
(2) In Greece *M. phoebe* has not been confirmed as occurring south of Mt. Vardousia, Fokida (Lafranchis pers. obs., ex Pamperis pers. comm.), and is absent from the Peleponnese (Lafranchis 2007).
(3) In Italy *M. phoebe* is not known to occur in southern Calabria, or in Sicily where only *M. ornata* is present (Russell and Pateman 2011: 26, as *telona*); however, Villa et al. (2009: 244) gave the distribution of *M. phoebe* as throughout Italy including Sicily.
(4) In the east *M. phoebe* is absent from Israel, except coastal areas in the North (Benyamini, pers. comm.), southern and eastern Iran and Iraq, except for one record from the extreme northeast (Tshikolovets et al. 2014: 319), although this may refer to the record of Wiltshire (1957: 33), who referred to f. *dorae* and stated that there was only one generation per year, flying in early summer. This suggests that this was most probably not *M. phoebe* but *M. ornata*.
(5) So far as the authors are aware *M. phoebe* is also absent from Jordan, where it is replaced by *M. ornata* (Katbeh-Bader et al. 2003: 17; Wahlberg and Zimmermann 2000: voucher specimen).
(6) It is quite likely that *M. phoebe* is absent from Syria; although Riemis (1993: 93) recorded *M. phoebe* from 50 km south of Aleppo on the road to Damascus, this was before *M. ornata* was separated at species level. The only figured specimens known to the authors from Syria (Van Haeringen 2015) are eight individuals labelled "*M. phoebe telona*" (= *M. ornata*), originating from Bloudan (26.iv.2008), Halbourn (27.iv.2008) and Damascus (5.iv.2010). These specimens exhibit antennal and wing morphological characters typical of *M. ornata* (see Table 1).

Those European regions in which both *M. phoebe* and *M. ornata* have been recorded as being present (although not necessarily sympatric or synchronic) are as follows: France (Var only), Italy (northern Calabria as far north as Campania (Russell and Pateman 2011), Greece (central and north, see above), Macedonia (FYROM) (Verovnik et al. 2010; Verovnik 2012; Russell et al. 2015), Montenegro (Russell 2015), Slovenia (Russell et al. 2014), Hungary (Varga et al. 2005). There are additional reports of the presence of *M. ornata* (unconfirmed) from regions where *M.*

Table 1. Identification difficulties arise in part because of a lack of clear diagnostic features to guarantee separation of adult butterflies; the only apparently constant feature appears to be the colour of late instar larvae. However, there are other features which might aid identification, presented here with an indication of their level of usefulness.

Character	*M. phoebe*	*M. ornata*	*M. punica*	Reliability of character
number of ova in batch	usually more than 100	usually 30–60	data lacking	good
larva L4- final instar head colour	black	red-brown	black	confirms *M. ornata*
final instar larva lateral stripe colour	white (*phoebe phoebe*) orange (*phoebe occitanica*)	no obvious stripe	orange	good (confirms *occitanica* outside North Africa)
distal end of antenna	club shaped	spatulate	variable	fair
shape of forewing apex	acute	rounded	rounded	fair
wing underside background colour	creamy	white	white	fair
hindwing underside premarginal marks	arcuate	triangular	variable, often triangular	poor
premarginal markings touching veins	yes	no	variable, often not touching	fair
voltinism	single to triple brooded	strictly univotine	double to triple brooded	good

phoebe is also known to occur – Croatia (Koren and Štih 2013), Romania (Rákosy and Varga 2001; Székely 2008), Bulgaria (Kolev 2015), and Slovakia (Zitnan pers. comm.). The report by Jakšić (2011: 46–47) of *M. ornata* from Serbia is considered to be dubious; it is not otherwise known from there, and *M. phoebe* is widespread throughout that country. In the east, both species occur in Lebanon and Israel (*M. phoebe* occurs in northern coastal district only; Benyamini, pers. comm.), Turkey (Hesselbarth et al. 1995), the Caucasus (Tshikolovets and Nekrutenko 2012: 293–295; Tikhonov and Russell 2015), the Russian Federation (Russell and Kuznetsov 2012), Syria (but see above), northeast Iraq and northern and western Iran (Tshikolovets et al. 2014). Eisenstein (2000: 190, fig. 234) figured a larva in Israel with a red-brown head feeding on *Centaurea iberica* (Spreng) (*M. ornata*: see also Russell et al. 2007).

The authors see no evidence to support subdivision of *M. ornata* into five subspecies (Tshikolovets 2011: 498–499); previous gaps in the known distribution of this species are rapidly being filled, making recognition of subspecies on a geographical basis increasingly difficult to support. Also, the diverse variety of host-plants used by *M. ornata* is more likely to be dependent on which Asteraceae species are available for use by larvae in any particular locality, rather than any evolutionary preference resulting in development of subspecies. The differing ability of closely related species to metabolise apparently suitable host-plants is also significant (Tóth et al. 2015); however, it is of interest to note that different host-plants were being used by *M. ornata* on the adjacent eastern Aegean Islands of Lésvos and Chíos, where adult butterflies were almost identical (Russell and Pamperis 2011; Russell and Pateman 2013c).

Despite use of the name *punica* by various authors for populations of *M. ornata* in a number of different countries, *Melitaea punica* is entirely confined to North Africa, where it is restricted to Morocco and Algeria; there have been no reports from Tunisia (see Appendix: Note 3).

Synonymic list

Melitaea phoebe abbas Gross & Ebert, 1975 [Note 7] [Type Locality (TL): 50 km. NW Ardkan, Tange Sorkh, Fars, Iran, 2250 m, 12–15.vi.1975].

Melitaea ornata adversaria Korb, Stradomsky & Kuznetsov, 2015 [Note 8] [TL: Kirghizia, Kirghiz Mts., Ala-Too settlement vicinity, 1100–1200 m].

Melitaea phoebe var. ***aetherea*** Eversmann, 1851 [Note 9] [TL: Russia 'au Sud qu'au Nord'].

Melitaea phoebe aethereaeformis Verity, 1919 [Note 10] [TL: central Italy].

Melitaea phoebe alatauica Wagner, 1913 [Note 11] [TL: Issyk-kul, Ili mountains, Kazakhstan].

Melitaea phoebe ab. ***albina*** Verity, 1904 [Note 12] [TL: Lucca, Italy]

Melitaea phoebe allophylus Rütimeyer, 1942 [Note 13] [TL: Porté, Pyrénées Orientales, France].

Melitaea phoebe almana Gaede, 1930 [Note 14] [TL: Elman Dagh N Syria]

Melitaea phoebe alternans Seitz, 1909 [Note 15] [TL: Zermatt, Switzerland].

Melitaea phoebe Knoch var. ***amanica*** Rebel, 1917 [Note 16] [TL: Kushdjula, Taurus Mountains and Das Dagh, Amanus Mountains, Turkey].

Melitaea phoebe rovia autumnalis Fruhstorfer, 1919 [Note 17] [TL: between Brione & Contra, Italy].

Melitaea phoebe ab. ***baccata*** Delahaye, 1909 [Note 18] [TL: Saint-Barthélemy, Maine-et-Loire, France].

Melitaea phoebe Knoch rassa ***bethune-bakeri*** de Sagarra, 1926 [Note 19] [TL: Sierra Nevada, Spain].

Melitaea phoebe Knoch sbsp. n. ***canellina*** Stauder, 1922 [Note 20] [TL: vicinity of Innsbruck, Austria].

Melitaea phoebe capreola Varga, 1967 [Note 21] [TL: Podalia, Kiverci, Ukraine].

Melitaea phoebe var. ***caucasica*** Staudinger, 1870 [Note 22] [TL: "Kindermann ganz ähnliche Stücke im Caucasus fing (?-Helenendorf; Kindermann leg.)"].

Melitaea phoebe caucasicola Verity, 1919 [Note 23] [TL: "Kindermann ganz ähnliche Stücke im Caucasus fing (?-Helenendorf; Kindermann leg.)"].

Melitaea phoebe changaica Seitz, 1909 [Note 24] [TL: Changai Mountains, Mongolia].

Melitaea phoebe ab. ***cinxioides*** Muschamp, 1905 [Note 25] [TL: Switzerland].

Melitaea phoebe Knoch ab. ***confusa*** Joannis, 1908 [Note 26] [TL: Vannes, France].

P.* [*apilio*]** N. Phal. [*Nymphalis Phaleratus*] ***corythallia Esper, [1781] [Note 27] [TL: France (environs of Paris?)]

Melitaea phoebe crassenigra Verity, 1928 [Note 28] [TL: Rozier, Gironde, France].

Melitaea phoebe form ***deleta*** Verity, 1919 [Note 29] [TL: Tuscany, Italy].

Melitaea phoebe Knoch ***dorae*** Graves, 1925 [Note 30] [TL: Nabatea, Petra, Jordan].

Melitaea phoebe tusca emipauper Verity, 1919 [Notes 31 & 96] [TL: Vallombrosa, Tuscany, Italy].

Melitaea phoebe emipunica Verity, 1919 [Note 32] [TL: Palermo district, Sicily, Italy].

Melitaea phoebe mod. ***enoch*** Higgins, 1941 [Note 33] [TL: Askhabad, Turkmenistan].

Melitaea phoebe occitanica f. ***estrela*** Higgins, 1941 [Note 34] [TL: Sierra de Estrela, Portugal]

Melitaea phoebe Knoch ab. ***fasciata*** Galvagni, 1934 [Note 35] [TL: 'Austria Inferior'].

Melitaea phoebe Knoch rassa ***occitanica*** Staudinger 2-gen. ***francescoi*** de Sagarra, 1926 [Notes 5 & 36] [TL: between St. Pere & Vilamajor, Catalonia, Spain, July/August].

Melitaea phoebe gaisericus Hemming, 1941 [Note 37] [TL: Mogador (=Essaouira), Morocco].

Melitaea phoebe galliaemontium Verity, 1928 [Note 38] [TL: Mont Dore, Puy de Dome, France].

Melitaea phoebe gerinia Fruhstorfer, 1917 [Note 39] [TL: Lisbon, Portugal].

Melitaea phoebe ab. ***geyeri*** Aigner-Abafi, 1906 [Note 40] [TL: Szaár (Komitat Fejér), Hungary].

Melitaea phoebe guevara Fruhstorfer, 1917 [Note 41] [TL: Castile, Spain].

Melitaea phoebe Knoch ab. ***gürtleri*** Joukl, 1908 [Note 42] [TL: Plitvička Jezera, Croatia]

Melitaea phoebe occitanica f. ***juliae*** Molina & Ocete, 1986 [Note 43] [TL: Loma de la Amoladera, Guadalcanal (Seville), Spain]

Melitaea phoebe koios Fruhstorfer, 1908 [Note 44] [TL: Klausen, Switzerland].

Melitaea phoebe kovacsi Varga, 1967 [Note 45] [TL: Budakeszi, Hungary].

Melitaea phoebe leechi Rothschild, 1917 [Note 46] [TL: Mogador (= Essaouira), Morocco].

Melitaea phoebe lokris Fruhstorfer, 1908 [Note 47] [TL: Saratov, Russia].

Melitaea phoebe malvida Gaede, 1930 [Note 48] [TL: Meklen Pass, Bosnia].

Melitaea phoebe mandarina Seitz, 1909 [Note 49] [TL: Mongolia].

Melitaea phoebe var. ***melanina*** Bonaparte, 1831 [Note 50] [TL: Monti Subiaco (= Livata), near Santa Scolastica, Arbruzzo, Italy.

Melitaea phoebe minoa Fruhstorfer, 1917 [Note 51] [TL: Engadin, Switzerland].

Melitaea phoebe ab. ***minor*** Wheeler, 1903 [Note 52] [TL: Switzerland].

Melitaea phoebe monilata Verity, 1919 [Note 53] [TL: Wallis (= Valais), Switzerland].

Melitaea phoebe monilataeformis Verity, 1919 [Notes 54 & 96] [TL: Tuscany, Italy].

Melitaea phoebe narenta Fruhstorfer, 1917 [Note 55] [TL: Jablanica, Herzegovina].

Melitaea phoebe nigroalternans Verity, 1919 [Note 56] [TL: Mont Cenis, French/Italian border].

Melitaea phoebe nigrogygia Verity, 1939 [Note 57] [TL: Abbazia = Opatija, Istria, Croatia].

Melitaea phoebe mod. ***nimbula*** Higgins, 1941 [Note 58] [TL: Espinama, Picos de Europa, Cantabria, Spain].

Melitaea phoebe occitanica Staudinger, 1871 [Note 5] [TL: Andalusia, Spain].

Melitaea phoebe ogygia Fruhstorfer, 1907 [Note 59] [TL: Island of Poros, Greece].

Melitaea phoebe ornata Christoph, 1893 [Notes 2 & 6] [TL: *Circa* 'Guberli', promontorium uralensium australium (Guberlya, Orenburg Province, Russian Federation)].

Melitaea phoebe Schiff. ***ornatiformis*** (gen. aestiva) de Sagarra, 1930 [Note 60] [TL: Villacabras, Cuenca, Spain].

Melitaea phoebe ottonis Fruhstorfer, 1917 [Note 61] [TL: "Kindermann ganz ähnliche Stücke im Caucasus fing (?-Helenendorf; Kindermann leg.)"].

P. **[*apilio*]** NP ***Paedotrophos*** Bergsträsser, 1780 [Note 62] [TL: Hanau-Münzenberg, Germany]

Melitaea phoebe subsp. ***parascotosia*** Collier, 1933 [Note 63] [TL: Sutschan, Russian Federation].

Melitaea phoebe ab. ***parva*** Gerhard, 1882 [Note 64] [TL: Fünfkirchen (= Pecs), Hungary].

Melitaea phoebe var. ***parva*** Caradja, 1895 [Note 65] [TL: Bucharest, Romania].

Melitaea phoebe pauper Verity, 1919 [Notes 66 & 96] [TL: Florence, Italy].

P. **[*apilio*] *phoebe*** Denis & Schiffermüller, 1775 [Notes 1, 4 & 6] [TL: environs of Vienna, Austria].

Melitaea phoebe phoebina Turati, 1919 [Note 67] [TL: Aspromonte Mountains, Calabria, Italy].

Melitaea phoebe postnarenta Verity, 1939 [Note 68] [TL: St. Dionisio, Mt. Olympos, Greece].

Melitaea phoebe postogygia Verity, 1939 [Note 69] [TL: Salonica (= Thessalonica), Greece.

Melitaea phoebe virgilia postvirgilia Verity, 1950 [Notes 70 & 100] [TL: Vence, Alpes-Maritimes, France].

Melitaea phoebe pseudosibina Alberti, 1969 [Note 71] [TL: Mt. Elbrus, Itkol, Kabardino-Balkaria, Russia].

Melitaea phoebe punica Oberthür, 1876 [Notes 3 & 6] [TL: Tazoult-Lambèze (Lambessa), Algeria].

Melitaea phoebe punica-powelli Oberthür, 1915 [Note 72] [TL: Algeria].

Melitaea phoebe forma ***punicata*** Ragusa, 1919 [Note 73] [TL: Sicily, Italy].

Melitaea ornata reliquiae Korb, Stradomsky & Kuznetsov, 2015 [Note 74] [TL: Russia, Volgograd Province, Olkhovsky distr., Kamenny Brod].

Melitaea phoebe rostagnoi Turati, 1920 [Notes 75 & 96] [TL: Rome, Italy].

Melitaea phoebe rovia Fruhstorfer, 1919 [Note 76] [TL: Monte Generoso, Maroggia, Tessin, Switzerland].
Melitaea phoebe f. ***rubialesi*** Gómez Bustillo, 1973 [Note 77] [TL: Loeches (Madrid), Spain]
Melitaea phoebe forma ***rubrofasciata*** Gušić, 1922 [Note 78] [TL: Podsused, nr. Zagreb, Croatia].
Melitaea phoebe Knoch ***sarvistana*** Wiltshire, 1941 [Note 79] [TL: Sarvistan, SE of Shiraz salt lake, Iran].
Melitaea phoebe var. ***saturata*** Staudinger, 1892 [Note 80] [TL: Kentai Mountains, Mongolia].
Melitaea phoebe ab. ***seminigra*** Delahaye, 1909 [Note 81] [TL: Pignerolles, Maine-et-Loire, France].
Melitaea phoebe Knoch var. ***sextilis*** Jachontov, 1909 [Note 82] [TL: Zheleznovodsk, Stavropol Krai, Russian Federation (North Caucasus)].
Melitaea phoebe Knoch var. ***sibina*** Alphéraky, 1881 [Note 83] [TL: Kuldjà, Ili Valley, China].
Melitaea phoebe rostagnoi ab. ***sterlineata*** Turati, 1920 [Note 84] [TL: Monte Autore (Province of Rome), Italy].
Melitaea phoebe streltzovi Kolesnichenko & Yakovlev, 2004 [Note 85] [TL: Western Mongolia, Hovd aimak, 30 km north-northwest from Bulgan somon, junction of Bajan-Gol and Bulgan-Gol rivers, 1500 m 11–13 August 2003].
Melitaea phoebe subcorythallia Verity, 1928 [Note 86] [TL: Auzay, Vendée, France].
Melitaea phoebe suboccitanica Verity, 1928 [Note 87] [TL: Auzay, Vendée, France].
Melitaea phoebe subtusca Verity, 1952 [Notes 88 & 96] [TL: Nans-les-Pins, St. Baume, Var, France].
Melitaea phoebe sylleion Fruhstorfer, 1917 [Note 89] [TL: Cogne, Piedmont, Italy].
Melitaea phoebe tatara Krulikovsky, 1891 [Note 90] [TL: Casanum = Kazan or Casan, Republic of Tatarstan, Russian Federation].
Melitaea phoebe telona Fruhstorfer, 1907 [Note 91] [TL: Jerusalem, Palästina (Israel)].
Melitaea phoebe *forma* ***totila*** Stauder, 1914 [Note 92] [TL: Monte Cocuzzo, Consenza, Calabria, Italy].
Papilio tremulae Piller & Mitterpacher, 1783 [Note 93] [TL: between Drau & Sawe, Croatia].
Melitaea phoebe tungana Seitz, 1909 [Note 94] [TL: "Sajan District", Russian Federation].
Melitaea phoebe tungusa Herz, 1899 [Note 95] [TL: Witim & Vilui mountains, Siberia, Russian Federation].
Melitaea phoebe tusca Verity, 1919 [Note 96] [TL: Tuscany, Italy].
Melitaea phoebe var. ***occitanica*** ab. ***uclensis*** Melcón, 1910 [Note 97] [TL: Uclo, Cuenca, Spain].
Melitaea phoebe ufensis Krulikovsky, 1902 [Note 98] [replacement name for ***uralensis*** [Note 99]].
Melitaea phoebe uralensis Krulikovsky, 1897 [Note 99] [TL: district of Ufa, Russia].
Melitaea phoebe virgilia Fruhstorfer, 1917 [Note 100] [TL: Alpes Maritimes, France].
Melitaea phoebe wagneri Wnukowsky, 1929 [Notes 11 & 101] [replacement name for ***alatauica*** Wagner].
Melitaea phoebe scotosia yagii Nire, 1917 [Note 102] [TL: *c.* 5 km west of Mt. Asama, Shinano Province, Japan].
Melitaea zagrosi Tóth & Varga, 2011 [Note 103] [TL: Zagros Mountains, Iran].

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Appendix

Note 1. ***Melitaea phoebe*** (Denis & Schiffermüller, 1775) [Type Locality (TL): environs of Vienna, Austria]: type material lost; neotype ♂ designated by Tennent and Russell (2010), reared from larva collected from near Vienna, Austria. An often double or even triple brooded species.

Note 2. ***ornata***: (***Melitaea ornata***) Christoph, 1893 [TL: *Circa* 'Guberli', promontorium uralensium australium (near Guberlya, Orenburg Province, Russian Federation)]: this taxon was first recognised as a species distinct from *phoebe* by Tóth and Varga (2011), based on morphometric measurements of male and female genitalia. It was discovered in the Volgograd region at Ilovlya by Tuzov and Churkin (2000: 73, pl. 46, figs 7–9 & 15–17) who wrongly used the name *M.* (*phoebe*) *punica*; Kuznetsov and Stradomsky (2010) subsequently used the name *Melitaea telona*. Kuznetsov (2011) provided details of the biology of this taxon and Russell and Kuznetsov (2012: figs 1–3) demonstrated that larvae from the Volgograd region had red-brown heads. This character is diagnostic for *M. ornata* (within the *Melitaea phoebe* species group – *M. cinxia* larvae also have red-brown heads).

The colourful adults were illustrated by Higgins (1941: pl. 14, fig. 10), Gorbunov and Kosterin (2007: 2: 84, figs 197, 198) and van Oorschot and Coutsis (2014: pl. 12: figs 20, 21 & pl. 13: figs 2, 3). *M. ornata* contrasts with the less colourful *M. phoebe* flying at the same localities in the southern Ural Mountains (present authors, pers. obs.). Tshikolovets (2011: 498) and Tshikolovets et al. (2014: 319) recognised *ornata* as a distinct species. The fact that van Oorschot and Coutsis (2014: 60) placed *ornata* as a synonym of nominotypical *phoebe* is in part what prompted the present paper. The first author has reared many hundreds of specimens of both *phoebe* and *ornata* from many localities in Europe and both authors have seen adults of the two species (sympatric but not synchronic) flying in the Urals. There can be no doubt whatever that *Melitaea phoebe* and *Melitaea ornata* (=*telona*: see Note 91) are distinct species, with different early stages, voltinism (*M. ornata* is invariably single brooded *M. phoebe* often double or triple brooded) and they often have different host-plants.

Recognition of *ornata* as a distinct species paved the way for the realisation that what had recently been referred to as "*emipunica*" (Russell et al. 2005), "*ogygia*" (Varga et al. 2005) and "*telona*" (Kuznetsov and Stradomsky, 2010) all represented the same species (*i.e. ornata*).

Note 3. ***punica***: (***Melitaea punica***) Oberthür, 1876 [TL: Tazoult-Lambèze (Lambessa), Algeria]: This species was described by Oberthür (1876: 25) as a subspecies of *M. phoebe*, but Oberthür himself subsequently raised it to the status of a distinct species (Oberthür 1914: 102). It is now recognised as a distinct species by most modern authors. Following the unfortunate introduction of a quadrinomen "*M.* (*phoebe*) *punica telona*" (this actually encompassed three distinct species: *phoebe*, *punica* and *ornata* [as *telona*]) by Hesselbarth et al. (1995: 1030), the status of *punica* became very confused. It was repeated in that form by Koçak (2000: 9), and a number of authors (e.g. Koçak and Seven 1998: 4) used the combination "*Melitaea punica telona*". Nazari (2003) placed all the taxa mentioned (including *telona* but not *punica*) as synonyms of *M. phoebe*, with the rather unhelpful note: "For further synonymy see Higgins (1941: 338–343)".

Subsequently, and presumably as a direct result of the action by Hesselbarth et al. (1995: 1030), the name *punica* was frequently wrongly associated with the name *telona* Fruhstorfer, 1908 (see also Note 2). For example Abadjiev (2000, 2001: 271), Tuzov and Churkin (2000: 73, pl. 46, figs 7–9, 15–17), Rákosy and Varga (2001), Gorbunov and Kosterin (2003 2: 84) and more recently Baytaş (2007: 128), Székely (2008: 175), Aghababyan (2012: 13), Hüseyinoğlu and Akyol (2013: 11 & 14) and Hüseyinoğlu (2013: 1293), all used

the combination '*Melitaea* (*Cinclidia*) (*phoebe*) *punica*' for the taxon *ornata*. This confusion was undoubtedly brought about by the fact that the underside hindwing pattern (particularly in the submarginal area) of *M. punica* (*cf.* Russell et al. 2006: figs 12–26) is very similar to those non-*phoebe* specimens from Europe and Turkey. This was clearly demonstrated by Russell and Pamperis (2011: 140–142 & figs 3–8; 2012) and Russell and Pateman (2012: figs 4–7). Other authors simply used the name *punica* for the species which was not *M. phoebe s.s.*: *e.g.* Leraut (1999: 173), who gave the distribution of "*C*[*inclidia*] *punica*" (*i.e. Melitaea punica*) as Italy to Turkey and Jordan, with no mention of North Africa, the TL of *punica* and the only place where *M. punica* is actually known to occur.

More recently, Tóth and Varga (2011) and van Oorschot and Coutsis (2014: 66) separated *punica* from *phoebe* on the basis of differences in the male genitalia, and this was followed by Tshikolovets (2011: 497). Collectively, the published literature during the last two decades has created substantial confusion which, insofar as it affects *M. punica*, is clarified here: *Melitaea punica* is confined to North Africa; it occurs from the Atlantic coast of Morocco throughout the Atlas and Rif Mountains to eastern Algeria but apparently not into Tunisia (Tennent 1996: 52). The larva is very similar to that of *M. phoebe occitanica* (Note 5) (Russell et al. 2006: figs 1–4 & 6); however, *punica* butterflies in North Africa are quite different in appearance to *phoebe occitanica* in Spain (*cf.* Higgins 1941: pl. 14, figs 6 & 11; Russell et al. 2006: figs 8–26; Tolman and Lewington 2008: 203).

Note 4. ***Melitaea phoebe phoebe***: The body of the final instar larva of *M. phoebe phoebe* is black, including the head carapace, with black or orange tubercles and white spots spaced around each segment; these spots usually coalesce on each side to form an often prominent lateral white line (see Table 1; also Bodi 1985: plate XI, fig. 92; Lafranchis 2000: 391, fig.; Russell et al. 2007: 159, fig. 14; Lafranchis 2007a: 41, fig. 13; Lafranchis 2008: 6 (fig.); Tennent and Russell 2010: 151, fig. 9). Its distribution ranges from the Ural Mountains to *c.* 60° N., through the Caucasus, south to Iraq, Iran and Lebanon, reaching its southern limit in northern Israel (Benyamini pers. comm.), westwards through Turkey, the Balkans, Hungary, Austria, southern Germany and the alpine and sub-alpine regions of France, Switzerland and Italy.

Some of the name bearing types originate from the eastern Palaearctic. For the sake of completeness these have been included. They are synonymised with nominotypical *phoebe* due to the fact that Kosterin (see Korshunov and Gorbunov 1995) described a final instar larva of *M. phoebe* from near Zabaikalye (south-eastern Russia) as follows: "white with fine black reticulate ornament, so that looks grey; this ornament fuses into a black line along the back and a more diffuse line on either side (between 2nd and 3rd row of false spines from beneath); a white stripe (without ornament) goes through 2nd row beneath false spine row. Thoracic legs and ventral prolegs yellowish-grey; head greyish-black, set with tiny black hairs". This description precisely matches that of the final instar larvae of the European populations of nominotypical *phoebe*. Adult butterflies are very variable, and we are unable to separate populations of *phoebe s.s.* in western Europe to the Urals into distinct races (subspecies).

Note 5. ***Melitaea phoebe occitanica*** Staudinger, 1871 [TL: Andalusia, Spain]: the Type Locality of this subspecies was given originally by Staudinger as "It" (= Italy?) but it is now generally accepted that this was an error (*recte* 'Iberia': Higgins 1941: 336); Verity (1928: 163) limited the Type Locality to Barcelona, Spain, and this was accepted by van Oorschot and Coutsis (2014: 60). Previously, however, Fruhstorfer (1916: 82 (A) (2): 1) was of the opinion that the source of the *occitanica* phenotype was Andalusia and Higgins (1941: 336) considered that this should stand, based on the original description by Staudinger, who did not specify a 'Type' but labelled the series upon which the description was based with the word '*original*' (Higgins 1941:

336). The body of the final instar larva of *M. phoebe occitanica* is black, including the head, with obscure white spots on the body, black tubercles dorsally and a row of orange tubercles with orange hairs laterally, which form an obvious orange lateral line (Lafranchis 2000: 388, fig.; Maravalhas 2003: 281, fig.; Russell et al. 2007: 159, fig. 13; Lafranchis et al. 2015: 464–467, figs), in contrast to the white lateral line of nominotypical *phoebe* (see Table 1, and Note 4).

This subspecies has also been separated from nominotypical *phoebe* using the results of enzyme electrophoresis by Pelz (1995: 57), who was of the opinion that genetic differences were sufficiently significant for *occitanica* to be considered as a "semispecies". This subspecies is distributed from the Iberian Peninsula eastwards through France and peninsular Italy as far south as northern Calabria (Russell pers. obs.); it has also been found in Istria, Croatia (Russell and Pateman 2013a: 47, fig. 6).

Tshikolovets (2011: 496) suggested that the distribution of this subspecies included northern Greece, the southern and eastern parts of the Balkans, western Turkey and Ukraine. The present authors do not agree and consider that these areas are occupied by nominotypical *phoebe*; larvae from Romania, for example, are clearly of the 'white lateral stripe form' associated with nominotypical *phoebe* (Russell et al. 2007: 159, fig. 13). Where the two subspecies meet, for example in Var, France and Istria, Croatia, the larvae can be intermediate in form, as one might expect (Russell and Pateman 2013: 47, figs 8, 9). The colourful adult has been illustrated by many authors, including Higgins (1941: pl. 14, fig. 11), Manley and Allcard (1970: plate 10, figs 1–7) and Lewington in Tolman and Lewington (1997: plate 50).

Note 6. The species ***phoebe, punica, ornata***: despite a series of articles (e.g. Russell et al. 2005, 2006, 2007), Tolman and Lewington (2008: 202–203) recognised only one species *M. phoebe*. However, all three species were separated using DNA sequences by Lenevue et al. (2009) and Tóth et al. 2014. Recognition of these distinct species is now accepted by most recent authors (Tshikolovets 2011: 496–499; Tóth and Varga 2011; van Oorschot and Coutsis 2014: 60–64 & 66), although not necessarily using correct species and/or subspecies names in the correct combinations. The *raison d'être* for this paper is to resolve this nomenclatural muddle.

Note 7. ***abbas*** Gross & Ebert, 1975: 44, fig. 61: synonym of ***Melitaea ornata***. Tshikolovets et al. (2014: 320, map) gave this taxon subspecific status of *M. ornata* and stated that it was found in west and south Iran. Their figures (Plate LX: figs 7, 8, 10, 11 & 12) depicted specimens which appear to have spatulate antennae and black arched submarginal underside hindwing markings not touching the intervening veins, both features typical of *M. ornata* (see Table 1). Subsequently, van Oorschot and Coutsis (2014) figured 5 specimens (plate 13: figs 8, 11, 12, 13 & 16), all from western Iran, of *M. ornata* (as *M. telona*).

Note 8. ***Melitaea ornata adversaria*** Korb, Stradomsky & Kuznetsov, 2015: 142 & plate VI: tentative synonym of ***Melitaea ornata.*** This material has been classified as both *Melitaea phoebe saturata* (Korb 2011: 158: see Note 80) and *Melitaea ornata adversaria* (Korb et al. 2015). The latter was based on molecular analysis of the preserved specimens and we Note that Korb et al. (2015: 142) considered that *M. phoebe* was not present in the Kyrghyz Mountains. The flight period was given (Korb 2011: 158) as May–July, at elevations between 500 and 2000 m; we consider that July is likely to be beyond the flight time of *M. ornata* and that larvae would be in diapause by the end of June. So far as we are aware, larvae of the *Melitaea* populations in this region have not been reported; our synonymy is thus tentative, pending further data.

Note 9. ***aetherea*** Eversmann, 1851: 5: 73 and plate IX: figs 5, 6: synonym of **nominotypical *phoebe***. Synonymised with *M. phoebe* by Higgins (1941), and followed by van Oorschot and Coutsis (2014: 60). A

large but weakly marked form (Higgins 1941: 338, plate 14: fig. 9). Korshunov and Gorbunov (1995: species 174) gave a very full description of the larva of this form, which clearly associated it with nominotypical *phoebe*. Tshikolovets (2011: 497) used this name at subspecies rank.

Note 10. ***aethereaeformis*** Verity, 1919: 183: synonym of ***phoebe occitanica***. Specimens from central Italy which were similar in appearance to *aetherea* Eversmann, 1851 (Higgins 1941: 338) were due to its geographical location placed with *occitanica*. Overlooked by van Oorschot and Coutsis (2014).

Note 11. ***alatauica*** Wagner, 1913, vol. 2: 89 (fig.): Junior primary homonym of *M. parthenie alatauica* Staudinger, 1881, and presumed synonym of **nominotypical *phoebe***. The authors consider that this name is most probably related to *M. phoebe* since it occurs in the eastern Palaearctic outside the presently known eastern limit of the distribution of *M. ornata* (see introduction). Placed with *M. phoebe* by van Oorschot and Coutsis (2014: 60), who suggested that it could be synonymous with *M. sibina* Alphéraky, 1881 (see Note 83).

Note 12. ***albina*** Verity, 1904: 54: we cannot place this form with either *M. phoebe* or *M. ornata*. An aberrant individual having the ground colour of the right hindwing yellowish-white (Higgins 1941: 339); both species may occur in the Lucca region of Italy.

Note 13. ***allophylus*** Rütimeyer, 1942: 438: synonym of ***phoebe occitanica***. Higgins (1955: 118) recognised this form as "leading to *occitanica* Staudinger" and suggested that it should be synonymised with *M. corythallia* Esper, 1781 (*i.e. phoebe occitanica*, see Note 27).

Note 14. ***almana*** Gaede, 1930: 208: probable synonym of ***Melitaea ornata***. This name, attributed to Rebel, appears to have been first published by Gaede under *M. phoebe* (in Seitz, Supplement). Neither Higgins (1941: 339) nor the present authors were successful in their efforts to find an original Rebel reference, and as a result it is provisionally treated as a Gaede manuscript name. Gaede stated that it was a pale race from Asia Minor similar to *M. telona* (*i.e. ornata*). Hesselbarth et al. (1995: 1031) referred to Graves (1925: 101), who stated that this form came from Elma Dagh, Syria. They suggested that it may have been a misspelling of *amanica* Rebel (see Note 16) and synonymised it with *Melitaea punica telona* (*i.e. ornata*), although it is Noted that Gaede treated both names separately. Not mentioned by van Oorschot and Coutsis (2014).

Note 15. ***alternans*** Seitz, 1909: 216: synonym of **nominotypical *phoebe***. A large brightly coloured subalpine form; not figured by either Seitz (1909) or Higgins (1941) but figured by Tolman and Lewington (1997: plate 50; 2008: 203 [same painting]); Higgins (1941: 339) suggested that it was 'proceeding to *occitanica* Staudinger' but only because of its brighter colouring, which is typical of both Alpine and Spanish specimens. See also *monilata* (Note 53).

Note 16. ***amanica*** Rebel, 1917: 252: synonym of ***Melitaea ornata***. Tshikolovets and Nekrutenko (2012: 295) synonymised this form with *telona*, placing the latter as a subspecies of *M. ornata*, and recorded its distribution as the Lesser Caucasus, Djavakheti-Armenian plateau and Talysh. The form is univoltine, with a flight period of May (sometimes late April) – June. Tuzov et al. (2000: plate 46: figs 7–9) figured three specimens in colour with the legends: "*Melitaea* (*phoebe*) *punica amanica* Rebel", two from Armenia, Azavan and one from Azerbaijan, Talysh Mts, Zuvand Plateau, Gosmalyan, 1500 m, 4.vi.1981. Antennal clubs of these specimens appear short and the hindwing underside markings in the submarginal area appear similar to those

of *M. ornata*. Van Oorschot and Coutsis (2014: plate 13, fig. 7) figured in colour a specimen from Armenia, Vedi, vicinity of Chosrov, 27.v.1974, under the name *M. telona* (*i.e. ornata*), which appears from its underside hindwing markings to be correct.

Note 17. ***autumnalis*** Fruhstorfer, 1919: 169: synonym of **nominotypical *phoebe***. The second generation form of *rovia* Fruhstorfer, 1919 (see Note 76). Bernardi and de Lesse (1951: 141) identified a holotype for *autumnalis* (as *automnalis*).

Note 18. ***baccata*** Delahaye, 1909: 10: aberration of ***phoebe occitanica***. The supplement in which this name was published was not available to Higgins (1941: 339), but was kindly supplied to the authors by Eric Drouet. The name refers to an aberrant female specimen which was taken in August at Saint-Barthélemy, Maine-et-Loire in west-central France and thus outside the known ranges of both nominotypical *phoebe* and *M. ornata*. Not mentioned by any recent author.

Note 19. ***bethunebakeri*** de Sagarra, 1926: 130: synonym of ***phoebe occitanica***. Higgins (1941: 339) correctly considered it synonymous with *occitanica* Staudinger 1871. Not mentioned by van Oorschot and Coutsis (2014).

Note 20. ***canellina*** Stauder, 1922: 18: synonym of **nominotypical *phoebe***. Higgins (1941: 339) suggested this was synonymous with *minoa* Fruhstorfer, 1917 (see Note 51); the TL places it outside the known ranges of both *phoebe occitanica* and *ornata* but within the distribution of nominotypical *phoebe*. Overlooked by van Oorschot and Coutsis (2014).

Note 21. ***capreola*** Varga, 1967: 131: synonym of ***Melitaea ornata***. Varga described this as a subspecies of *M. phoebe*, but subsequently (Tóth and Varga 2011) placed it with *M. ornata*; van Oorschot and Coutsis (2014: 63) placed it with *M. telona* (*i.e. ornata*).

Note 22. ***caucasica*** Staudinger, 1870: 59, Taf. 1 fig. 2: synonym of **nominotypical *phoebe***, but name preoccupied by *M. didyma caucasica* Staudinger, 1861; see *ottonis* Fruhstorfer, 1916 (a replacement name for *caucasica*: Note 61), and *caucasicola* Verity, 1919 (Note 23), a later replacement name. A lectotype ♀ and a paralectotype ♂ were designated by Nekrutenko (Hesselbarth et al. 2: 1028) from the Staudinger collection, housed at Zoologisches Museum der Humboldt Universität, Berlin.

Note 23. ***caucasicola*** Verity, 1919: 184: a replacement name for *caucasica* Staudinger, 1870 (see Note 22); a junior subjective synonym of *ottonis* Fruhstorfer, 1916 (see Note 61).

Note 24. ***changaica*** Seitz, 1909: 217: synonym (provisional) of **nominotypical *phoebe***. Occurs in the eastern Palaearctic, further east than the presently known eastern limit of the distribution of *M. ornata*. Kosterin figured a final instar larva of this taxon from 10 km NNW of the village of Tasyrkhoi S Chita region (Dahuria), Transbaikalia, Siberia, Russia, 19.vi.1995. Its black head carapace confirms probable synonymy with *M. phoebe*.

Note 25. ***cinxioides*** Muschamp, 1905: 69 (fig.): aberrational form of **nominotypical *phoebe***. Its origin in Switzerland is outside the distributional areas of both *phoebe occitanica* and *M. ornata*. An aberrant form with black spots in the submarginal brown spots of the hindwing upperside, resembling *M. cinxia*. This recurrent

aberration is known to occur almost anywhere (pers. obs.). Placed with *M. phoebe* by Higgins (1941: 339). Not mentioned by any recent authors.

Note 26. ***confusa*** Joannis, 1908: 45: synonym of ***phoebe occitanica***. An aberrant ♂ form in which the upperside forewings are more reddish with the black markings reduced, the transverse black lines in the discal region are nearly obliterated and the hindwings are dark basally. The underside forewings have similar markings but the hindwings are yellowish white with enlarged dark markings. Higgins (1941: 339) attributed this name to Oberthür but with Joannis' reference, and he did not correct this in his *errata* (Higgins 1944). The TL of Brittany, northwest France, places it outside the known ranges of nominotypical *phoebe* and *M. ornata*. Not mentioned by any recent authors.

Note 27. ***corythallia*** Esper, [1781]: 65, 67, Taf. 61, figs 4, 5: synonym of ***phoebe occitanica***. Verity (1928: 163) was of the opinion that *occitanica* Staudinger (see Note 5) should be placed as a synonym of *corythallia* Esper, on the basis that he believed the specimens representing *corythallia* originated from the Iberian Peninsula. Higgins (1941: 336) disagreed with this course of action and showed that Verity's assumption was incorrect, as Esper ([1781]: 67), stated that they were the original specimens of Geoffroy's *Papilio cinxia* var. *B*, which were from France (Higgins 1941: 336). Whether the origin of the specimens of *corythallia* were from France or Spain is unimportant because the same subspecies of *M. phoebe* (*i.e. occitanica*) occurs in both countries. Hesselbarth et al. (1995: 1028) and van Oorschot and Coutsis (2014: 60), synonymised this name with *M. phoebe*. Although the name *corythallia* predates *occitanica*, type material of the former appears to be lost (Hesselbarth et al. 1995: 1028) and the name *occitanica* has been used extensively by authors in referring to *phoebe* populations from the Iberian Peninsula. The present authors have followed this course of action.

Note 28. ***crassenigra*** Verity, 1928: 162: synonym of ***phoebe occitanica***. An *occitanica* form with heavy discal spotting from southwest France (Higgins 1941: 339).

Note 29. ***deleta*** Verity, 1919: 184: aberration of (presumably) ***phoebe occitanica***. Aberrant female of form *tusca* (see Note 96) with almost all the black markings obliterated (Higgins 1941: 339). Larvae reared from populations of *M. phoebe* from peninsular Italy have, so far as the authors are aware, all been of the *occitanica* form (see Note 5).

Note 30. ***dorae*** Graves, 1925: 100: synonym of ***Melitaea ornata***. Graves (1925: 103–106) gave a two page description of this form, and a table of "Index of Nigrescence of *M. phoebe* races (upperside)", which demonstrated that it was paler than either *telona* or *ogygia*. Higgins (1941: 339) paraphrased this description as "small and pale, with the black markings fine and partly obsolete"; this is typical of phenotypes in xerothermic biotopes. Hesselbarth et al. (1995: 1031) synonymised this name with '*M. punica telona*' (*i.e. ornata*) and Tshikolovets (2011: 499) with '*Melitaea ornata telona*' (*i.e. ornata*). Van Oorschot and Coutsis (2014: 63) synonymised this with *M. telona* (*i.e. ornata*) and illustrated (van Oorschot and Coutsis 2014: plate 13, fig. 6) a specimen from Wadi Zarqa, Jordan, 400 m, the underside hindwing pattern and spatulate antennae of which suggest synonymy with *ornata*.

Note 31. ***emipauper*** Verity, 1919: 184: synonym of ***phoebe occitanica***. Described by Verity as a medium sized, summer brood form of *tusca* Verity, 1919 (Higgins 1941: 340) (see Note 96).

Note 32. ***emipunica*** Verity, 1919: 184: synonym of ***Melitaea ornata***. This name was used by Russell et al. (2005) when the species was first identified as being distinct from *M. phoebe* by the red-brown head colour of the stage L4 to the final instar larvae, reared from a female taken at Montagna Longa, within the Type Locality (*i.e.* Sicily). This was afforded subspecific status by Tshikolovets (2011), with a distribution given as SE France (Var), Sicily and S Italy (Calabria, Basilicata, Campania). It was synonymised with *M. telona* (*i.e. ornata*) by van Oorschot and Coutsis (2014: 63). Brief use of *emipunica* by Russell et al. (2005) and of *ogygia* by Varga et al. (2005) was before the wide distribution of *M. ornata* was fully appreciated, and was (in part) the cause of ensuing confusion.

Note 33. ***enoch*** Higgins, 1941: 337: synonym of ***Melitaea ornata***. Figured by Higgins (1941: plate 14, fig. 4), who gave other locations for this form: Arwas and Achal Tekke, 2000 m, July, and Jablonowka from the same region (Transcaspia). He placed it with *M. phoebe occitanica* but suggested that this placement was due to the colour contrast of the wings being similar to, but not quite so strongly marked as, those of 'Spanish *occitanica'*. Higgins further noted a slight difference in male genitalia and suggested the possibility that *enoch* should be ranked as a subspecies of *M. phoebe*. Tshikolovets et al. (2014: 319 and plate LX: figs 6 and 9) placed *enoch* as a subspecies of *M. ornata*. Van Oorschot and Coutsis (2014: 63) placed it as a synonym of *M. telona* (*i.e. ornata*).

Note 34. ***estrela*** Higgins, 1941: 337: ***phoebe occitanica***. Said by Higgins (1941: 337) to be: "very bright … labelled *estrela* Romei, but I cannot trace a reference to a description, and do not know whether the name was ever published validly …"; the present authors have also failed to find a published reference by Romei, and place the name as a *nomen nudum*.

Note 35. ***fasciata*** Galvagni, 1934: 2: an aberration of **nominotypical *phoebe***. This extreme aberration has the upper surface of the wings almost black with the forewing discal macules radially elongated into a fascia. The specimen was taken on 6.viii.1933 near Vienna; its origin places it with nominotypical *phoebe*. The name has been used by a number of authors to describe specimens in which the black markings coalesce to form fasciae; for example Wiltshire (1946: 26; plate 3, fig. d) used it to describe a specimen of *M. phoebe* from Shiraz, Fars, SW Iran, suggesting it was similar to "mod. or ssp. *telona*" (= *ornata*).

Note 36. ***francescoi*** de Sagarra, 1926: 130: synonym of ***phoebe occitanica***. A name raised for specimens of the second brood of *occitanica* Staudinger, 1871, flying in July/August (Higgins 1941: 340) (see also Note 5).

Note 37. ***gaisericus*** Hemming, 1941: 207: synonym of ***Melitaea punica***. A replacement name for *leechi* Rothschild (see Note 46) (Higgins 1941: 340); Higgins (1941: pl. 15, fig. 8) figured an example from Azrou, Morocco. Synonymised with *M. punica* by van Oorschot and Coutsis (2014: 66).

Note 38. ***galliaemontium*** Verity, 1928: 162: synonym of ***phoebe occitanica***. A name raised for small, second brood specimens (Higgins 1941: 340) from France. Overlooked by van Oorschot and Coutsis (2014).

Note 39. ***gerinia*** Fruhstorfer, 1917: 1: synonym of ***phoebe occitanica***. This form is more uniform in colour than the contrasting highly coloured form found in Spain (Higgins 1944: 340) (see Note 15). In raising the name *gerinia*, Fruhstorfer (1917: 1–2) did not refer to specimens he had seen, as a result of which Bernardi and de Lesse (1951: 141) were unable to identify syntypes.

Note 40. ***geyeri*** Aigner-Abafi, 1906: 208: **status uncertain**. It is not possible to synonymise this aberrant male with either *M. ornata* or nominotypical *phoebe*, since both fly in Hungary (*cf.* Varga 1967; Varga et al. 2005). This name was credited to Abafi-Aigner (sic) by Higgins (1941: 340).

Note 41. ***guevara*** Fruhstorfer, 1917: 19: synonym of ***phoebe occitanica***. A lightly marked form from Spain with pale yellow ground colour, markings reduced on both wing surfaces (Higgins 1941: 340). It was synonymised by van Oorschot and Coutsis (2014: 61) with *M. phoebe*; its origin suggests it is synonymous with *phoebe occitanica* (see also Note 19).

Note 42. ***gurtleri*** Joukl, 1908: 97: **status uncertain**. This name was based on a single aberrant specimen, with a bright orange ground colour on the upper surface of the wings and underside wing bases that were said to be very dark. This sounds like *M. ornata* rather than *M. phoebe*, but the presence of *M. ornata*, although reported from Croatia (Koren and Štih 2013) has yet to be confirmed there. *M. phoebe* is certainly present further north than the Plitvice Lakes [TL], in Istria (Russell and Pateman 2013a, b). Overlooked by van Oorschot and Coutsis (2014).

Note 43. ***juliae*** Molina & Ocete, 1986: 869: form of *Melitaea phoebe occitanica*.

Note 44. ***koios*** Fruhstorfer, 1908: 194: synonym of **nominotypical *phoebe***. Holotype examined by Bernardi and de Lesse (1951: 141) from specimens in the Museum National d'Histoire Naturelle de Paris (MNHN). Van Oorschot and Coutsis (2014: 60) gave the TL as: "Italy (S Tyrol), Switzerland (Klausen)". Higgins (1941: 340) synonymised this large and rather dark form with nominotypical *phoebe*, and this was followed by van Oorschot and Coutsis (2014: 60).

Note 45. ***kovacsi*** Varga, 1967: 131: synonym of ***Melitaea ornata***. This form has been placed in various combinations, including *M. ogygia kovacsi* (Varga et al. 2005) and *M. ornata kovacsi* (Tóth and Varga 2011). The post diapause larvae have red-brown heads (Varga et al. 2005: 67, fig. 2; Russell et al. 2007: 159, fig. 18). The present authors can find no significant morphological features to separate *kovacsi* from nominotypical *ornata*.

Note 46. ***leechi*** Rothschild, 1917: 99: ***Melitaea punica***. A junior primary homonym of *Melitaea leechi* Alphéraky, 1895 (van Oorschot and Coutsis 2014: 66) (see also Note 37).

Note 47. ***lokris*** Fruhstorfer, 1908: 194: synonym of **nominotypical *phoebe***. The upperside black pattern is more extensive than that of *ottonis* Fruhstorfer, 1916 (see Note 61) (Higgins 1941: 340). Type material was examined by Bernardi and de Lesse (1951: 141) from specimens in the MNHN, Paris.

Note 48. ***malvida*** Gaede, 1930, *in* Seitz (Supplement: 207, fig. 13d): presumed synonym of **nominotypical *phoebe***. Gaede attributed this name to Fruhstorfer, but without a date; unable to find an original Fruhstorfer reference, Higgins (1941: 340) attributed it to Seitz (we have also failed to find any original Fruhstorfer reference, but we note that the *Melitaea* section of Seitz' Palaearctic supplement was by Gaede, not Seitz). Gaede noted that *malvida* had pointed forewings, suggesting a form of *phoebe* rather than of *ornata* and suggested an association with form *narenta* (see Note 55). He also illustrated (in Seitz 1930, Supplement: plate *Neptis-Argynnis*, fig. d: 5) the upperside, which is not helpful for identification. Although Tóth et al. (2014: 752, fig. 1, map) indicated the presence of *M. ornata* in Bosnia, no locality in Bosnia was given in their specimen

list (Tóth et al. 2014: 751, table 1); the present authors are not aware of any modern records of *ornata* from Bosnia, and a TL of Bosnia suggests synonymy with nominotypical *phoebe*. Thurner (1964: 34), using the name *malvinda* Fruhstorfer (presumably a misspelling of *malvida*), suggested this form was also found in the Republic of Macedonia (formerly Yugoslavia).

Note 49. ***mandarina*** Seitz, 1909: 217: synonym (provisional) of **nominotypical *phoebe***. This very large form (Higgins 1941: 340) occurs in the eastern Palaearctic, considerably further east of the presently known eastern limit of *M. ornata*. Higgins (1941:340) suggested its separation from form *changaica* (see Note 24) was doubtful. Synonymised with *phoebe* by van Oorschot and Coutsis (2014: 60).

Note 50. ***melanina*** Bonaparte, 1831 (125): 159: aberration of ***phoebe occitanica***. This male aberration had the discal ground colour of the underside of the hindwings and the submarginal lunules black. It was taken in July at Subiaco, which is only 400 m above sea level, thus it was almost certainly a specimen from a second brood, ruling out *M. ornata*. Not mentioned by any modern authors.

Note 51. ***minoa*** Fruhstorfer, 1917 (A. 2): 2: synonym of **nominotypical *phoebe***. Higgins (1941: 341) treated this as a small dark race found at high levels, probably identical with nominate *phoebe*; van Oorschot and Coutsis (2014: 61) also placed this with *M. phoebe*. Type material was examined by Bernardi and de Lesse (1951: 141).

Note 52. ***minor*** Wheeler, 1903: 84: an aberration of **nominotypical *phoebe*** based on size, specimens having less than 38 mm wingspan. This was an infra-subspecific name, with no status under The Code, but for the record, the name is preoccupied by *Melitaea arcesia minor* Elwes, 1899 (Higgins 1941: 341). Higgins (1941: 341) suggested, and the present authors concur, that the authority was probably Wheeler as there is no reference given for Frey in Wheeler's book.

Note 53. ***monilata*** Verity, 1919: 184: synonym of **nominotypical *phoebe***. A large, boldly marked and bright alpine form; a specimen of this form from Simplon, Berisal, Switzerland, was figured by Higgins (1941: plate 14, fig. 1); who believed (Higgins 1941: 341) it was related to *ottonis* (Note 61). It is placed with nominotypical *phoebe* due to its TL and similarity to *alternans* (Note 15). Overlooked by van Oorschot and Coutsis (2014).

Note 54. ***monilataeformis*** Verity, 1919: 184: synonym of ***phoebe occitanica***. This name was raised by Verity (1919: 184) for those specimens of *tusca* Verity, 1919 (see Note 96), which displayed *monilata* characters (see Note 53); a TL of peninsular Italy suggests synonymy with *phoebe occitanica*.

Note 55. ***narenta*** Fruhstorfer, 1917 (A. 2): 1, pl. 1, fig. 1: synonym of **nominotypical *phoebe***. Fruhstorfer gave the TL as "Jablanica, Herzegovina", which van Oorschot and Coutsis (2014: 61) wrongly interpreted as Mount Jablanica, which is on the Macedonia (FYROM)/Albania border. Seitz (1909: 207) and Higgins (1941: 341) described this as a large dark race, likening it to *ottonis* (see Note 61). Holotype ♂ inspected by Bernardi and de Lesse (1951: 141). Adults reared from a population of confirmed *M. phoebe* (*i.e.* final instar larvae with black heads and a white lateral stripe) from Serbia were large and dark (Peter Russell pers. obs.); it is likely that such adults are referable to *narenta*. Both sexes of this form were figured by Gaede (in Seitz 1930:

supplement: pl. *Neptis-Argynnis*, figs d: 3, 4) but these were not as dark as reared specimens from Serbia. Synonymised with *phoebe* by van Oorschot and Coutsis (2014: 61).

Note 56. ***nigroalternans*** Verity, 1919: 184: synonym of **nominotypical *phoebe***. An alpine form, which resembles *alternans* (see Note 15) but with a more extensive black pattern (Higgins 1941: 341). Overlooked by van Oorschot and Coutsis (2014).

Note 57. ***nigrogygia*** Verity, 1939: (17): synonym of ***phoebe occitanica***. There has been some confusion related to this taxon. The TL was clearly stated by Verity (1939: (17); 1938: plate III, figs 12 and 14) to be Abbazia, Istria. At that time Istria was part of Italy but after World War 2 it became part of Croatia and the name was changed to Opatija. Higgins (1955: 118) gave the TL as "St. Dionisio, Macedonia at 800 m., gen. 2", mistakenly using data from Verity's *postnarenta* (see Note 68). Tóth and Varga (2010: 274) correctly cited the TL as 'Opatija, Croatia'; but later wrongly as 'Opatija, Macedonia' (Tóth and Varga 2011: 264). Tóth and Varga (2011: 259–260), who did not examine any specimens from Croatia in their published researches on *Melitaea phoebe* species-group genitalia, suggested that 'race' *nigrogygia* was a subspecies of *M. ornata* and not of *M. phoebe*. Van Oorschot and Coutsis (2014: 63) also placed this taxon under '*Melitaea telona*' (*i.e. ornata*) as opposed to *M. phoebe*, accepting the information for the TL given by Higgins (1955: 118) (John Coutsis pers. comm.). Verity (1950: 4 p.152 and Tav. 43: figs 70 and 71) figured the same two ♂♂ he figured in 1938, with the added information: 'captured 15 May' (year not stated) with the original locality data: 'Abbazia, Istria'. A capture date of 15 May does not fit with second generation specimens of *M. phoebe*, as was suggested by Higgins (1955: 118). Russell and Pateman (2013a, b) reared a brood of *M. phoebe* from eggs laid by a female "*nigrogygia*" taken within 20 kilometres of Opatija; the larvae had black heads throughout their lives and most had an orange lateral stripe, clearly associating the taxon *nigrogygia* with *M. phoebe occitanica,* with which it is synonymised here. A study of Verity's actual specimens may provide further enlightenment.

Note 58. ***nimbula*** Higgins, 1941: 337: synonym of ***phoebe occitanica***. Higgins (1941: 337) raised this name for specimens of *occitanica* (see Note 5) with an exaggerated black pattern on the upperside. It was overlooked by van Oorschot and Coutsis (2014).

Note 59. ***ogygia*** Fruhstorfer, 1907: 310: synonym of ***Melitaea ornata***. Recognised as a distinct species by Lafranchis (2007a, b, 2008) but considered a subspecies of *M. ornata* by Tshikolovets (2011), with a distribution of 'S. and C. Greece (including Peleponnese and W. Aegean Is.); probably S.-W. Bulgaria and European Turkey'. *M. ornata* appears to be widespread in Bulgaria (Kolev 2015, pers. comm.). Hesselbarth et al. (1995: 1031–1033) listed over 150 locations for this species (as '*punica telona*'), all of which were in Asian Turkey. So far as the authors are aware *M. ornata* has not been recorded from the Greek region of Thrace, adjacent to European Turkey (Pamperis 2009: 433). The name *ogygia* was placed as a subspecies of *M. ornata* by Tshikolovets (2011: 498), as a synonym of *M. punica telona* (*i.e. ornata*) by Hesselbarth et al. (1995: 1030), and as a synonym of *M. telona* (*i.e. ornata*) by van Oorschot and Coutsis (2014: 63). Russell et al. (2007: 159, figs 16, 17) demonstrated that the larvae had red-brown heads and thus *ogygia* is placed as a synonym of *M. ornata*. The TL was given by Hesselbarth et al. (1995: 1031) as 'Poros, Meerenge von Salamis'; the Straits of Salamis do not exist near Poros Island, nor does it feature on any of the original specimen labels (Russell and Pamperis 2011: 143). Holotype identified by Bernardi and de Lesse (1951: 140).

Note 60. ***ornatiformis*** de Sagarra, 1930: 114: synonym of ***phoebe occitanica***. Type material taken by Querci, 24.viii.1928 at Villacabras, central Spain. Despite its nomenclatural association with *ornata*, geographical source clearly places this with *phoebe occitanica*.

Note 61. ***ottonis*** Fruhstorfer, 1917 (A. 2): 1, nota: synonym of **nominotypical *phoebe*** (a replacement name for *M. phoebe* var. *caucasica* Staudinger 1870 (see Note 22)). Higgins (1941: pl. 14, fig. 1) figured an example of this form from Simplon, Berisal, Switzerland, from which the size and the wing markings clearly suggests synonymy with nominotypical *phoebe*. Tshikolovets (2011: 497) treated this as a subspecies of *M. phoebe*, as did Tshikolovets and Nekrutenko (2012: 293) and Tshikolovets et al. (2014: 318–319). Specimens figured by Hesselbarth et al. (1995 3: Tafel 80/81: figs 30–33 ♂♂; Tafel 82/83: figs 1–4 ♀♀) from eastern Turkey, by Tshikolovets (2003: plate 24: figs 16 ♂ and 17 ♀) from Taberda, Russian Caucasus and by Tshikolovets et al. (2014: plate LX, figs 1–3 ♀♀) from Iran suggest that *ottonis* is best placed as a synonym of nominotypical *phoebe*, as van Oorschot and Coutsis (2014: 61) suggested.

Note 62. ***paedotrophus*** Bergsträsser, 1780: 14, pl. 75, figs 5–6. Synonym of **nominotypical *phoebe***.

Note 63. ***parascotosia*** Collier, 1933: 54: ***Melitaea scotosia***. Name based on a single ♀ specimen taken in July 1923; the author considered this subspecies to be intermediate between *scotosia* Butler and *mandarina* Staudinger. Higgins (1941: 341) considered that the name was "Probably referable to *scotosia*". Lee (1982: 46) placed *scotosia* Butler [TL: Tokyo, Japan] as a subspecies of *M. phoebe*. However, Tuzov et al. (2000: 2: 74), Gorbunov and Kosterin (2007: II: 85) and van Oorschot and Coutsis (2014: 67) synonymised the name with *Melitaea scotosia* Butler, which occurs in the eastern Palaearctic. Although originally described as a subspecies of *M. phoebe*, it does not appear to be associated with any of the three taxa (*phoebe, ornata, punica*) dealt with in this paper.

Note 64. ***parva*** Gerhard, 1882: 126: synonym of **nominotypical *phoebe***. A bright "second generation" form, reared from a larva – colour and host-plant unknown. Higgins (1941) and van Oorschot and Coutsis (2014) overlooked this form.

Note 65. ***parva*** Caradja, 1895: 47: probable synonym of **nominotypical *phoebe***. A small, brightly marked variety of the first generation (Higgins 1941: 341). A larva from Transylvania, Romania, having typical characters (black head with white lateral stripe) of nominotypical *phoebe* was figured by Russell et al. (2007: 159, fig. 14). Székely (2008: 175–176) included reports (unconfirmed by larval head colour) by T. Hácz of *M. punica telona* (= *ornata*) from Transylvania and North-Dobrudja in Romania; however, these records were reported later by Hácz (2012: 73) as *M. phoebe*. Not mentioned by van Oorschot and Coutsis (2014). Since both this and the previous entry are infrasubspecific, they are not covered by The Code.

Note 66. ***pauper*** Verity, 1919:183: synonym of ***phoebe occitanica***. Described as a small, lightly marked form with pale ground colour, the usual summer brood form of *tusca* Verity, 1919 (Higgins 1941: 341 and pl. 14, fig. 3) (see also Note 96).

Note 67. ***phoebina*** Turati, 1919: 222: synonym of ***Melitaea ornata***. A small mountain form (Aspromonte, above 1400 m) rather dark and heavily marked, related to *totila* Stauder, 1914 (Higgins 1941: 341) (see Note 92). According to Turati (1919: 222) there is no second generation of this form, which he considered similar

to that from Ficuzza, Palermo, Sicily (see Note 32). The TL is outside the range of *M. phoebe*, which has not been observed south of Monte Martinellal, Cosenza, Calabria, at the much lower elevation of 880 m (*cf.* discussion on altitudinal separation in Italy in Russell and Pateman 2011: 28) from where 5♂♂ were taken by the first author (identification confirmed from genitalia, club shaped antenna and underside hindwing pattern). Overlooked by other authors, including van Oorschot and Coutsis (2014).

Note 68. ***postnarenta*** Verity, 1939: (17): synonym of **nominotypical *phoebe***. Verity (1939: (17) gave this name to small second generation specimens of *M. phoebe*, resembling *emipauper* (see Note 31). The TL and details of collection for this form were mistakenly attributed by Higgins (1955: 118) to *nigrogygia* (see Note 57). Resemblance to *emipauper* is superficial. Overlooked by van Oorschot and Coutsis (2014).

Note 69. ***postogygia*** Verity, 1939: (16): synonym of **nominotypical *phoebe***. Verity (1939: [16]) gave this name to a small form flying in the hills above Thessalonica in August; close association with the name *ogygia* (*i.e. M. ornata* – see Note 64) is misleading. Higgins (1955: 118) included the name in his list of synonyms of *M. phoebe* and indicated a similarity with *parva* (see Notes 64 and 65) and *pauper* (see Note 66). A second generation form (*M. ornata* is single-brooded – see Note 2) from central Greece places this taxon with nominotypical *phoebe*. It was overlooked by van Oorschot and Coutsis (2014).

Note 70. ***postvirgilia*** Verity, 1950: 154: synonym of **nominotypical *phoebe***. The second generation of the Alpine first generation form *virgilia* (see Note 100). Not listed by Higgins (1941, 1955) or any recent authors.

Note 71. ***pseudosibina*** Alberti, 1969: 192, Taf. 1, figs 1c and 2c.: synonym of **nominotypical *phoebe***. Synonymised with nominotypical *phoebe* by Hesselbarth et al. (1995: 1028), and with "*M. phoebe*" by van Oorschot and Coutsis (2014: 61). Judging from the paratypes figured by Alberti (1969: Taf. 1, figs 1c and 2c) and the specimen figured by van Oorschot and Coutsis (2014: plate 12, fig. 24), which has clubbed antenna and hindwing underside arcuate submarginal markings reaching the intervening veins, this is correct. Tshikolovets (2011: 497) placed it as a synonym of *Melitaea phoebe ottonis* (see Note 61), as did Tschikolovets and Nekrutenko (2012: 293).

Note 72. ***punicapowelli*** Oberthür, 1915: fig. 2338: synonym of ***Melitaea punica***. Specimens of *M. punica* which have the black pattern partly obsolete (Higgins 1941: 342).

Note 73. ***punicata*** Ragusa, 1919: 150: synonym of ***Melitaea ornata***. Equated to *emipunica* (see Note 32) by Higgins (1941: 342).

Note 74. ***reliquiae*** Korb et al., 2015: 143 and plate VI: synonym of ***Melitaea ornata***. Information on the populations in the Volgograd region was first published by Kuznetsov and Stradomsky (2010) under the name *Melitaea telona* and later by Russell and Kuznetsov (2012) under the name *M. ornata*.

Note 75. ***rostagnoi*** Turati, 1920: 223: synonym of ***phoebe occitanica***. A small second generation form, probably much the same as *emipauper* Verity (see Note 31) and *autumnalis* Fruhstorfer (see Note 17) (Higgins 1941: 342). Synonymised with *M. phoebe* by van Oorschot and Coutsis (2014: 61).

Note 76. ***rovia*** Fruhstorfer, 1919: 169: synonym of **nominotypical *phoebe***. According to Higgins (1941: 342) this is a low elevation form with reduced black markings. A holotype and allotype were examined by Bernardi and de Lesse (1951: 141). Synonymised with *M. phoebe* by van Oorschot and Coutsis (2014: 61).

Note 77. ***rubialesi*** Gómez Bustillo, 1973: 36: form of ***Melitaea phoebe occitanica***.

Note 78. ***rubrofasciata*** Gušić, 1922: 95: probably a synonym of **nominotypical *phoebe***: Higgins (1941: 342) Noted this as a small form with a deficiency of black pattern on the discal area of the wings. However, the name seems to indicate the presence of some red colour on the wings. Although Koren and Štih (2013) recorded *M. ornata* from five localities in Croatia, one of which was near Zagreb, the identity of the species has been questioned (Koren pers. comm.) The first author visited two of the locations concerned in May 2015 and considered that the biotope was unsuited to *M. ornata*. Podsused (the TL) is on the banks of the River Sava at *c*. 125 m above sea level and appeared on recent inspection to be encompassed by industrial buildings (Russell pers. obs.); it would seem unlikely that either species would be extant currently in that locality.

Note 79. ***sarvistana*** Wiltshire, 1941: 473, fig. 3: ***Melitaea sarvistana***. Originally described as a race of *M. phoebe* based on two male specimens; a large form, with black submarginal lunules complete on both wings, other markings faint with nearly obsolete discal markings; on the underside of hindwings the black markings are prominent (Wiltshire 1941). Wiltshire (1946: 25, plate 1: figs 1 and 2)), from an examination of the genitalia, elevated this to species status. Higgins (1955: 117, pl. I, fig. 17 pl. II, fig. 17) also considered it a distinct species. Eckweiler and Hofman (1980: 10), Racheli (1980: 80–81), Koçak et al. (1997: 4), Nazari (2003), Kolesnichenko (2007: 30), van Oorschot and Coutsis (2014: 69 and pl. 14, figs 20–22) and Tshikolovets et al. (2014: 321 and pl. LX, figs 13–15, 18) all followed Wiltshire in recognising *sarvistana* as a distinct species. The present authors have no personal experience of this taxon but it appears to be different from any examples of the taxa under consideration; its inclusion here is only because it was originally described in association with *M. phoebe*.

Note 80. ***saturata*** Staudinger, 1892: 323: synonym of **nominotypical *phoebe***. A large brightly coloured form resembling many mountain forms of *phoebe* (Higgins 1941: 342). It occurs in the eastern Palaearctic and, since the presently known eastern limit of the distribution of *M. ornata* is Kazakhstan, southeast of the Ural Mountains, placement with nominotypical *phoebe* seems appropriate. Synonymised with *M. phoebe* by van Oorschot and Coutsis (2014: 60). Korb (2011: 158) identified *Melitaea* specimens from N Tian-Shan as *M. phoebe saturata*. The TL of *saturata* is Mongolia, some 2500 km northeast from Tian-Shan. Korb et al. (2015: 142–143, Col. pl. VI, figs 3 and 4), who then considered that *M. phoebe* was absent from Tian-Shan, reassessed this population as *M. ornata*; we consider *saturata* a synonym of *M. phoebe phoebe*.

Note 81. ***seminigra*** Delahaye, 1909: 10: aberration of ***phoebe occitanica***. This aberrant female specimen, with almost black forewing uppersides, was taken in June at Pignerolles, Maine et Loire in west central France and thus outside the ranges of both nominotypical *phoebe* and *M. ornata*. Higgins (1941: 342) stated that he did not view the original publication and thus could make no comment on this name. It has not been mentioned by any recent author.

Note 82. ***sextilis*** Jachontov, 1909: 285: synonym of **nominotypical *phoebe***. A small second generation form of *caucasica* (see Notes 22, 61) taken in the southern Caucasus in August. Higgins (1941: 342) and van Oorschot and Coutsis (2014: 60) placed this with *M. phoebe*.

Note 83. ***sibina*** Alphéraky, 1881: 400, Tabl. XIV fig.13: **status unclear** (distinct species/synonym of **nominotypical *phoebe***). This taxon is distributed mainly outside the western Palaearctic, with a western distribution limit in the Republic of Kazakhstan (Tshikolovets 2003: 328). Originally described as a variety of *M.*

phoebe, it was given species status by Higgins (1941: 349, plate 15: figs 5, 6, 11 and 12) and this has been followed by some recent authors (for example: Tshikolovets 2003: 328–329, 2005: 338; van Oorschot and Coutsis 2014: 65–66). It does not appear to be directly associated with any of the three taxa dealt with in this paper. We note that Tóth and Varga (2011) and Tóth et al. (2014) were unable to separate it from *M. phoebe* using molecular or morphometric procedures.

Note 84. ***sterlineata*** Turati, 1920: 223, Tav. II, figs 10–12: synonym of ***phoebe occitanica***. Although placed by Turati as an aberration of *phoebina* (= *ornata*, see Note 64), the specimens were taken by GC Krüger, at 800 m altitude, in September 1909; it must therefore represent a second or even third generation form, which precludes it from being *ornata*, which is univoltine.

Note 85. ***streltzovi*** Kolesnichenko & Yakovlev, 2004: 103: synonym of **nominotypical *phoebe***. Distributed along the south-western slopes of the Mongolian Altai. All specimens taken in the first part of July, flying in mesophilous grasslands and river valleys. The figures (Kolesnichenko and Yakovlev 2004: figs 10, 11 on plates V and VI) show both sexes are heavily marked with a pale background on the upper surfaces of both fore- and hindwings. The club shaped antenna and the arcuate submarginal markings appearing to reach the intervening veins (see Table 1), suggest association with *M. phoebe* rather than *M. ornata*. Synonymised with *M. phoebe* using van Oorschot and Coutsis (2014: 61)

Note 86. ***subcorythallia*** Verity, 1928: 162: synonym of ***phoebe occitanica***. "The second generation of France" (Higgins 1941: 342).

Note 87. ***suboccitanica*** Verity, 1928: 162: synonym of ***phoebe occitanica***. "The first generation of France" (Higgins 1941: 342).

Note 88. ***subtusca*** Verity, 1952: 349: synonym of ***phoebe occitanica***. Verity (1952: 349) referred this form from southeast France to *tusca* from central Italy (see Note 96), and it is placed with *phoebe occitanica* as a result. *M. ornata* from Var, France occurs in a very different phenotype from the form of *phoebe occitanica* occurring in central Italy (Verity 1951: plate 44, figs 1–16), the former being much darker in colour and having triangular submarginal lunules (Russell et al. 2007: 162 fig. 52). Overlooked by van Oorschot and Coutsis (2014).

Note 89. ***sylleion*** Fruhstorfer, 1917 (A. 2): 2: synonym of **nominotypical *phoebe***. Higgins (1941: 342) considered this form to be inconsistent. The holotype and allotype were inspected by Bernardi and de Lesse (1951: 141). It was placed by van Oorschot and Coutsis (2014: 61) as a synonym of *M. phoebe*.

Note 90. ***tatara*** Krulikovsky, 1891: 236: **status uncertain** (possibly a hybrid). Spelt *tartara* (sic) by Higgins (1941: 342) but subsequently corrected (Higgins 1944: 46). The origin of this name refers to Tatastan, a Russian Province in which Casan, the TL, is located. Although Krulikovsky placed it under *M. phoebe*, *M. ornata* was not at that time established as a species. Higgins (1941: 342) said: 'An example in which there is a double black line across both wings parallel to the outer margin' but this is not helpful to place it with either species. Krulikovsky's figure (1890: 236, VIII, fig. g) does not allow identification; in fact Krulikovsky himself suspected that it was a hybrid between *M. phoebe* and *M. athalia*. Having later observed a ♂ *M. phoebe* coupling with a ♀ *M. arduinna* (Esper, [1783]), Krulikovsky (1897: 321), restated his suspicion that *tatara* was a

hybrid. It is noted that hybrids have been recorded between *M. ornata* and *M. phoebe* by Bálint and Ilonczai (2001: 217) in Hungary and by Russell et al. (2014: 140, figs 7–9) in Slovenia; since both species probably occur in this area to the west of the Urals in the Russian Federation, a hybrid origin remains a possibility.

Note 91. ***telona*** Fruhstorfer, 1907: 310: synonym of ***Melitaea ornata*** (but see below). The holotype and allotype were examined by Bernardi and de Lesse (1951: 140). This name was placed as a subspecies of *M. ornata* by Tshikolovets (2011: 499) and by Tshikolovets and Nekrutenko (2012: 295). This is the name used by a number of authors for what is now known to be *M. ornata*, including the first author (Russell 2008; Russell and Pateman 2011), prior to our present understanding of the range of *M. ornata*, which led to the recognition that *ornata* and *telona* were conspecific. Russell et al. (2007: 159, fig. 15) demonstrated that the larva of *telona* from its TL has a red-brown head; larvae of *ornata* from Volgograd region, Russia, are similarly coloured and also has a red-brown head (Russell and Kuznetsov 2012: figs 1–3), suggesting synonymy with *M. ornata*. However, recent molecular analysis by Tóth et al. (2014) apparently suggests that *telona* may represent a species distinct from *ornata*; only two samples of *telona* from Lebanon, the origin of the 'voucher specimen' used as an example of *telona* by Wahlberg and Zimmermann (2000) for their mtDNA sequencing, were included in their analysis. Until this is resolved, it is considered prudent to retain *telona* as a synonym of *M. ornata*. Rather confusingly, van Oorschot and Coutsis (2014: 63) considered *telona* a distinct species and placed *ornata* as a synonym of *M. phoebe*.

Note 92. ***totila*** Stauder, 1914: 373: synonym (provisional) of ***Melitaea ornata***. The first author visited Monte Cocuzzo, the TL, on a number of occasions but, in spite of the presence of a known host-plant (*Centaurea deusta* Ten.: Russell and Pateman 2011) only discovered one worn ♀ at *ca.* 1200 m, which unfortunately died prior to ovipositing. It appeared from its hindwing markings and spatulate antenna to be *M. ornata*. Also, a single ♂ was taken on Monte Mancuso, Calabria, some 24 km to the south, which from an examination of genitalia and external morphology, was almost certainly *M. ornata*. This form is therefore provisionally placed with *M. ornata*.

Note 93. ***tremulae*** Piller & Mitterpacher, 1783: 69, Taf. 4: figs 1 and 2: synonym (provisional) of **nominotypical *phoebe***. The TL of Croatia, from where there have been no substantiated reports of *M. ornata*, strongly suggests association with *phoebe phoebe*. Hesselbarth et al. (1995: 1028) synonymised this name with *M. phoebe phoebe*. Not mentioned by any more recent authors.

Note 94. ***tungana*** Seitz, 1909: 216: synonym (provisional) of **nominotypical *phoebe***. The specimens were described by Seitz (1909: 216) as very melanic but the specimens examined by Higgins (1941: 342) showed that this character was variable in the Sayan Mountains (the TL) and suggested that many of these specimens were close to *monilata* Verity (see Note 53) and other Alpine forms (see Higgins 1941: 334). The form *tungana* has a distribution in the eastern Palaearctic and outside the presently recorded distribution of *M. ornata*, the authors provisionally place *tungana* with *M. phoebe*. Overlooked by van Oorschot and Coutsis (2014).

Note 95. ***tungusa*** Herz, 1899: 240: synonym (provisional) of **nominotypical *phoebe***. A small form with obscure markings, in appearance somewhere between var. *caucasica* Staudinger (see Note 22) and *M. ornata* (see Note 2). Synonymised with *M. phoebe* by van Oorschot and Coutsis (2014: 60). Since it occurs in the eastern Palaearctic, it is synonymised with nominotypical *phoebe* until further information becomes available.

Note 96. ***tusca*** Verity, 1919: 183: synonym of ***phoebe occitanica***. Described by Verity (1909: 183) as a form with bright orange upperside ground colour and reduced black markings. Higgins (1941: 342) considered this to be a first (spring) brood form from central Italy, and was of the opinion that the names *emipauper* Verity, 1919, *pauper* Verity, 1919 and probably *autumnalis* Fruhstorfer, 1919 referred to the second or third (summer) broods of *tusca* (see Notes 31, 65 and 17, respectively). Placed here as a synonym of *phoebe occitanica* largely due to its geographical location in peninsular Italy. This name was overlooked by van Oorschot and Coutsis (2014).

Note 97. ***uclensis*** Melcón, 1910: 219: aberration of ***phoebe occitanica***. Described as an aberration of *occitanica* with the upperside black marginal semi-lunules separated from the black marginal line by red ground colour. Its origin in central Spain clearly places it with *occitanica*. Overlooked by van Oorschot and Coutsis (2014).

Note 98. ***ufensis*** Krulikovsky, 1902: 555 (footnote): synonym of ***Melitaea ornata***. A replacement name for *uralensis* Krulikovsky, 1897 (see Note 99); van Oorschot and Coutsis (2014: 60) incorrectly placed this as a synonym of *M. phoebe*.

Note 99. ***uralensis*** Krulikovsky, 1897: 3: name preoccupied by *Melitaea arduinna uralensis* Eversmann, 1844. Replaced with *ufensis* by Krulikovsky (1902: 555 footnote). Van Oorschot and Coutsis (2014: 60) incorrectly placed this as a synonym of *M. phoebe* (see Note 98).

Note 100. ***virgilia*** Fruhstorfer, 1917 (A. 2): 2: synonym of **nominotypical *phoebe***. Higgins (1941: 343) treated this as a large race with pale ground colour and black markings reduced, although he recognised that these features were not constant. The relatively larger than average size and its TL in the French Alps places this taxon with nominate *phoebe*, with which it was placed by van Oorschot and Coutsis (2014: 61). Holotype and 5 ♀♀ paratypes were examined by Bernardi and de Lesse (1951: 141).

Note 101. ***wagneri*** Wnukowsky, 1929: 222: replacement name for *alatauica* Wagner, 1913 (see Note 11).

Note 102 ***yagii*** Nire, 1917: 146, including fig. 2: ***Melitaea scotosia***.This taxon is confined to the eastern Palaearctic. The name *yagei* (sic) was synonymized with *M. scotosia* Butler, 1878 by Higgins (1941: 343). This synonymy and misspelling were followed by van Oorschot and Coutsis (2014: 67). Although originally placed with *M. phoebe*, it does not appear to be associated with any of the three taxa (*phoebe*, *ornata*, *punica*) dealt with in this paper.

Note 103. ***zagrosi*** Tóth & Varga, 2011: 265: synonym (provisional) of ***Melitaea ornata***. This name was raised as a distinct species based on male and female genitalia and underside wing markings. However, it would appear from Tshikolovets et al. (2014: 320, map) that the type locality of this form is within the distributional area of *abbas*, which they elevated to a subspecies of *Melitaea ornata*. Van Oorschot and Coutsis (2014: 64) discussed the status of *zagrosi* at some length, referring to the unreliability of wing markings, which has been demonstrated in *Melitaea* taxa by Jugovic and Koren (2014), and genitalia preparations when placed in covered slides creating distortion. They concluded that there was insufficient evidence to support the erection of a new taxon and classed it as '*status incertus*'. Tshikolovets et al. (2014: 320) synonymised it with *M. ornata abbas* (*i.e. ornata*) (see Note 7). The elevations at which these two forms occur (*zagrosi*, 300 m; *abbas*, 1500–2500 m) may be significant. Until additional evidence becomes available, it is provisionally placed with *M. ornata*.